Paper-IX (CHN503) Physical Chemistry

Unit I   Chemical Dynamics   18Hrs

Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory; ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions.

Dynamic chain (pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-chlorine reactions) and oscillatory reactions (belousov-Zhabotinsky reaction), homogeneous catalysis, kinetics of enzyme reactions, general features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method. Dynamics of barrier less chemical reactions in solution, dynamics of unimolecular reactions. (Lindemann and Hinshelwood theories of unimolecular reactions.)

Unit II   Surface Chemistry   18Hrs

Adsorption

Surface tension, capillary action, pressure deference across curved surface   (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), surface films on liquids. Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMS), factors affecting the CMC of surfactants, counter ion binding to micelles.

Macromolecules

Polymer – definition, types of polymers, electrically conductiong, fire resistant, liquid crystal polymers, kinetics of free radical chain polymerzation, mechanism of polymerization.

Molecular mass, number and mass average molecular mass, molecular mass determinations (osmometry, viscometry, diffusion and light scaffering methods), size of macromolecules

Unit III   Electro Chemistry- I   12Hrs

Electrochemistry of solutions, Debye-Huckel – Onsager treatment and its extension, ion solvent interactions, Debye-Huckel-Jerum mode. Thermodynamics of electrified interface equations. Derivation of electro-capillarity, Lippmann equations (Surface excess)) methods of determination, Structure of electrified interfaces. Guoy-Chapman, Stern, Bockris model.

Over potentials, exchange current density, derivation of Buller-Volmer equation, Tafel plot.

Unit IV   Electro Chemistry-II

Quantum aspects of charge transfer at electrodes-solution interfaces, tunneling, Semiconductor interfaces – theory of double layer at semiconductor, electrolyte solution interfaces, Effect of light at semiconductor solution interface.

Electrocatalysis – influence of various parameters, Hydrogen electrode. Bioelectrochemistry thereshold membrane phenomena, Nernst-planck equation, Hodges.

Huxley equations, electrocardiography, Polarogrophy – theory instrumentation, haf – wave potential and its significance. Polarography theory(No Derivation), half wave potential and its significance.